

CLAIMS

1. A thermoelectric conversion material comprising a porous material, wherein continuous electrical conduction paths are provided by forming voids in the form of independent closed pores or independent closed air tubes inside the material.

2. The thermoelectric conversion material according to claim 1, wherein the average pore diameter of the independent closed pores is $1\text{ }\mu\text{m}$ or less, or the average diameter of the independent closed air tubes is $1\text{ }\mu\text{m}$ or less.

3. The thermoelectric conversion material according to claim 1, wherein the distance between nearest voids is $5\text{ }\mu\text{m}$ or less.

4. The thermoelectric conversion material according to claim 1, wherein the density of the number of voids is $1 \times 10^{10}/\text{cm}^3$ or more.

5. A method of producing the thermoelectric conversion material according to any one of claims 1 to 4, wherein, in producing a thermoelectric material composed of a sintered body, microparticles having a particle diameter of $1\text{ }\mu\text{m}$ or less or a fibrous substance having a diameter of $1\text{ }\mu\text{m}$ or less that serves as a void-forming agent is mixed with a base powder, and in sintering this mixture, the mixed powder is sintered in an atmosphere of an inert gas, a reducing gas, or a controlled oxidizing gas so that after the

densification of a solid part formed by sintering the base powder proceeds, the void-forming agent is removed, thereby forming independent closed pores or independent closed air tubes, in which parts that have been excluded by the volume of the void-forming agent are not connected to each other, in a continuous dense matrix.

6. A method of producing the thermoelectric conversion material according to any one of claims 1 to 4, wherein, in producing a thermoelectric material composed of a sintered body, microparticles having a particle diameter of 1 μm or less or a fibrous substance having a diameter of 1 μm or less that serves as a void-forming agent is mixed with a base powder, and in sintering this mixture, the mixed powder is sintered at a temperature lower than the temperature at which the void-forming agent is gasified, dissolved, or melted so that after the densification of a solid part formed by sintering the base powder proceeds, the void-forming agent is removed, thereby forming independent closed pores or independent closed air tubes, in which parts that have been excluded by the volume of the void-forming agent are not connected to each other, in a continuous dense matrix.

7. The method of producing the thermoelectric conversion material according to claim 5 or 6, wherein the void-forming agent is removed by gasification, dissolution, or melting.

8. The method of producing the thermoelectric conversion material according to claim 5 or 6, wherein, after the densification of the solid part proceeds, sintering is performed at a temperature higher than the temperature at which the void-forming agent is gasified so that the void-forming agent is removed by gasification.

9. A method of producing the thermoelectric conversion material according to any one of claims 1 to 4, wherein, in producing the thermoelectric material, a porous material having pores opening to the outside is produced, and the pores disposed on the surface are closed by machining, a chemical reaction, an application of a sealing agent, or the like.

10. A method of producing the thermoelectric conversion material according to any one of claims 1 to 4, wherein, in producing the thermoelectric material, thin films composed of a porous material having pores opening to the outside are laminated to produce a laminate, and the pores disposed on the top surface and the bottom surface are closed by laminating thin films composed of a non-porous material.

11. A method of producing the thermoelectric conversion material according to any one of claims 1 to 4, wherein, in producing a thermoelectric material composed of a sintered body, a non-porous coating is formed on the surface of a powder composed of a porous material having openings on the

outside by machining, vapor deposition, a chemical reaction, an application of a sealing agent, or the like to prepare a base powder, and the powder is then sintered.